Menlo Park Notebook #245 [N-81-03-15]

This notebook covers the period March 1881. The entries are by Charles L. Clarke and consist of notes, calculations, and drawings relating to experiments with Porter-Allen and Buckeye dynamos. The label on the front cover is stamped "Charles L. Clarke." The book contains 280 numbered pages.

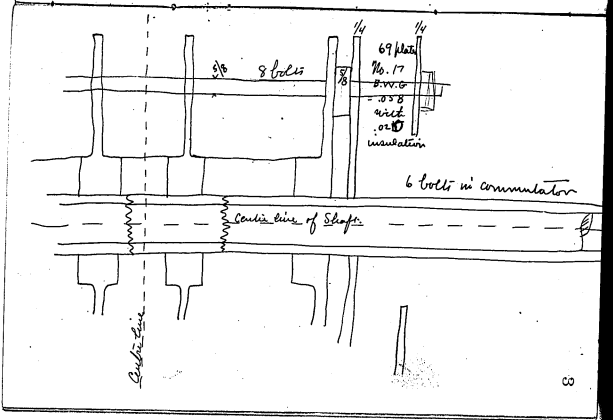
Blank pages not filmed: 32-280.

XE-172 N-81.03-15

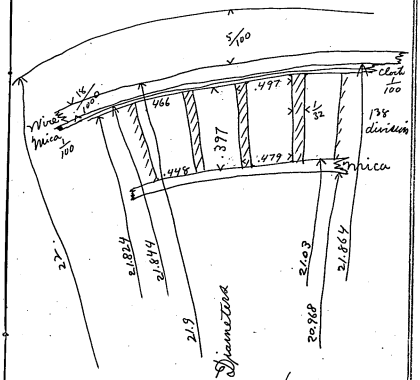
Buckeye Dynamo.
450
Revolutions.

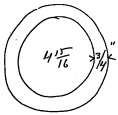
See Book 116
pages 116 to 139 and 209

B


1/4
1/4
69 Plate
No. 17
B.W.G
.058
wire
.020
insulation
5/8
8 bolts
5/8
6 bolts in commutator
Centre line of Shaft.
Centre line

.465 x
.4787


5/100
Clark 1/100
15/100
Vitreous Mica 1/100
.466
.497
.397
.448
.479
1/32
138 divisions
Mica
27°
2.1824
2.1844
2.19
Diameter
2.103
2.1864
20.960
69 commutator Block.


4 5/16
3 3/4"

March 15 9
4/16
1881

Curve of Magnetism

Clarke.

These experiments were conducted on the direct-acting Porter-Allen dynamo to find the curve of magnetism.

Available length of field

Diam. of field

Diam. of iron core of armature.

Experiments made with external circuit of high resistance Thompson mirror galvanometer.

Descending field curve.
Field weakening.
20 Daniels cells = 320.

Magnet	Armature	Revs.	at 1000 revs
173	70	216	324
167	70½	216	326.4
5-0	60	224	267.9
40	5-6	232	241.4
28	45	242	186
20	40	226	177

Ascending Curve.
Field strengthening.

Magnet	Amm.	Revs.	Amm. at 1000 revs.
Open	40	247	161.9
39	50	236	211.9
65	60	228	263.2
120	70	214	327.1
176	75	219	342.5
177	76	214	355.1

76 ltr limit of magnetisation was attained.

Field the broken

ascending curve.

Field strengthening.

Magnet-	Amm.	Revs.	Ampm. at 1000 revs.
Open	40	252	158.7
30	45	241	186.7
39	50	244	245.9
50	55	240	229.2
60	60	230	250.9
50	66	265	249.1
112	70	246	324.1

The speed of engine was gradually increased but no change was produced on magnet circuit.

Armature deflection was taken with engine at 628 revs. deflection 215°
with 112 in magnet.

Resistance of magnets (6 coils) = 23 ohms.

Comparison of the
Medium magnets with
Pirie-allen dynamo magnets

By experiment of Dec 10, 1880.
the deflection of 21.8 = 14,7 volts
gave a current of 10 webers,
the resistance of the magnet
being 1.47 ohms.

The corresponding deflection for armature was
144° = 97.2 volts at 965 revo. or 100.7 volts at
1000 revo.

There are 3 layers of 13W/1000 wire with 230 turns in each layer with an average diam. of 6.5 inches

0.15 .01
0.15 .01
0.15 .03

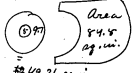
The total number of turns is 1380.

The coils are 3 feet long and 6 inches in diam.

The weight of the fields, cast together is 408. 8 lbs. = 1569.8 cu. in. 420 lbs. per cu. ft.

The iron of the armature, wrought iron plates at 480 lbs. per cu. ft. 45-5. 66 cu. in. = 126.6 lbs.

Total is 535.4 lbs.



= 49.26 sq. in.

The no. of commutator blocks is 75 and 2 turns in each coil. The effective length is therefore 75 × 2 × 9 1/4"

= 115.625 feet

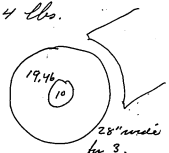
~~For one foot therefore~~

At 1000 revs. and armature diam. of 9.7" the surface speed is 2539.46 feet per m. and volts = 100.7.
At 1000 feet per m. the volts = 39.26
and for 1 ft. of cutting wire
= .339546 volts.

The free magnetism depends upon sq. root of diam. $= \sqrt{6}$
also sq. root of length $= \sqrt{36}$
also inversely as the separation of armature from dynamo field. $= \frac{1}{(.225)^2}$

" $8.34 \times \sqrt{6} \times \sqrt{36} \times \frac{1}{(.225)^2}$
$\times 1380 \times 10 \times$ Constant
$= .339546$

1/3 of
The Potei-Allen dynamo
weight of fields
744 lbs.



For 1/3 the length the contents
is 2043 cu. in. and being
made of ~~cast~~ wrought iron plates
Weight = $\frac{2043 \times 480}{1728}$ = 556 lbs.
The length of cores is 3 in 6½"
and drain. 7½".
There are 6 layers of No. 12
B.W.G. and 310 turns in each
layer. a total for 2 cores of
3720 turns.

There are 69 commutator blocks and armature wound with single turn and 28" long.
Effective length
$69 \times 28'' = 161$ feet
and $\frac{1}{3}$ of that for $\frac{1}{3}$ pair-
$= 53.7$ feet.
If C = current-
At 1000 revs. per m.
the cutting speed will be $\frac{3.1416 \times 19.46 \times 1000}{12}$
$= 5095$ feet per m.
If the proportions are true the following should hold
$(744 + 556)\sqrt{2.5}\ \sqrt{42.5} \times \frac{1}{(.52)^2}$
$\times 3720 \times C \times$ constant
$= .339546 \times \frac{1}{5.095 \times 53.7}$

The medium machine is wound with three layers - from page 20 we have the length is

$(6. + .15 + .15 + .15 + .01 + .01 + .03) 3.1416 \times 1380 \div 12$

$= 2348.346$ feet

and resis

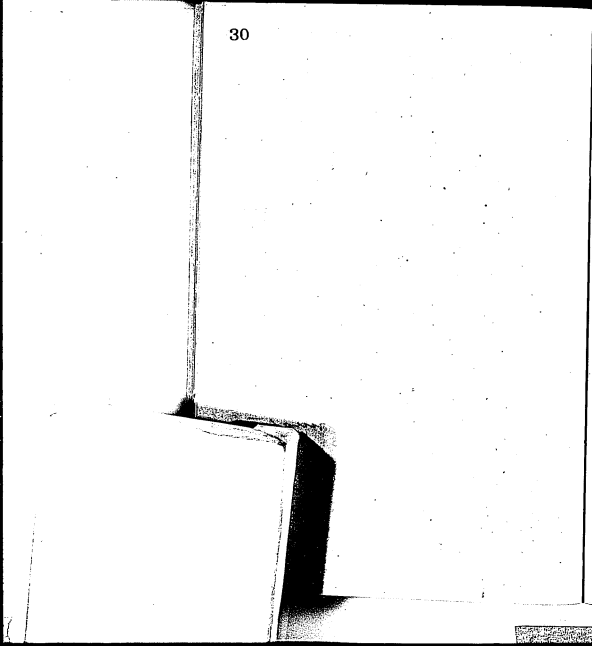
$$\frac{10.64 \times 2348.346}{750^2} = 1.48 \text{ ohms.}$$

Length of cutting wire

$$\frac{75 \times 2 \times 9.25}{12} = 115.625 \text{ feet}$$

To reduce the diagram of deflections on armature Dec. 10, 1880 to volts per foot of wire at 1000 feet per m multiply the degrees by

$$\frac{.671}{115.625 \times 2.45 \cdot 06} = .002382$$



For each degree on magnet multiply by

$$\frac{.675 \times 1380}{1.48} = 629.4$$